

Health Consultation

EVALUATION OF AIR DATA FROM
BAUMGARTNER INDUSTRIAL COMPLEX

CAMBRIDGE POINTE SUBDIVISION
CORNER OF HEINTZ ROAD AND BAUMGARTNER ROAD,
ST. LOUIS COUNTY, MISSOURI

OCTOBER 16, 2007

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Public Health Service
Agency for Toxic Substances and Disease Registry
Division of Health Assessment and Consultation
Atlanta, Georgia 30333

Health Consultation: A Note of Explanation

An ATSDR health consultation is a verbal or written response from ATSDR to a specific request for information about health risks related to a specific site, a chemical release, or the presence of hazardous material. In order to prevent or mitigate exposures, a consultation may lead to specific actions, such as restricting use of or replacing water supplies; intensifying environmental sampling; restricting site access; or removing the contaminated material.

In addition, consultations may recommend additional public health actions, such as conducting health surveillance activities to evaluate exposure or trends in adverse health outcomes; conducting biological indicators of exposure studies to assess exposure; and providing health education for health care providers and community members. This concludes the health consultation process for this site, unless additional information is obtained by ATSDR which, in the Agency's opinion, indicates a need to revise or append the conclusions previously issued.

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HEALTH CONSULTATION

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Prepared By:

Missouri Department of Health and Senior Services
Division of Community and Public Health
Bureau of Environmental Epidemiology
Under Cooperative Agreement with the
Agency for Toxic Substances and Disease Registry

STATEMENT OF ISSUES AND BACKGROUND

Statement of Issues

The Missouri Department of Health and Senior Services (DHSS), in cooperation with the federal Agency for Toxic Substances and Disease Registry (ATSDR), has completed this health consultation at the request of the St. Louis County Department of Health. This health consultation will review and comment on the ambient air sampling conducted within the Baumgartner Industrial Complex from April 12, 2006 through June 2, 2006 by Civil & Environmental Consultants, Inc. (CEC) at the request of the St. Louis County Department of Health. This health consultation addresses whether there are increased health risks to local residents that can be attributed to the ambient air in the Baumgartner Industrial Complex. This health consultation follows as a more in-depth response to a letter sent to the St. Louis County Department of Health by DHSS on February 2, 2007.

Background

The Baumgartner Industrial Complex is defined in CEC's Ambient Air Monitoring Report as being located along Baumgartner Road approximately between Lemay Ferry Road and Heintz Road in south St. Louis County, Missouri (1). See Figure 1. This area contains a combination of residential housing and industrial operations including wastewater treatment facilities, a rock quarry, and an asphalt plant (1). Starting in 1993, the Cambridge Pointe Subdivision (Cambridge Pointe) was developed within the eastern edge of the Baumgartner Industrial Complex, overlooking the eastern quarry high wall (2). Since that time, several residents of Cambridge Pointe have had concerns and complaints regarding odors and possible health risks associated with living in this area (1). Most of these concerns were associated with an asphalt plant located within the quarry, below and immediately adjacent to the subdivision. Access to the quarry and asphalt plant from Cambridge Pointe is inhibited by the sheer high wall descending from the western edge of the subdivision to the eastern edge of the quarry. See Figure 1.

In response to residents' concerns, the St. Louis County Department of Health contracted CEC to collect ambient air samples in the Baumgartner Industrial Complex. From April 12, 2006 through June 2, 2006, ambient air samples were collected in three locations in the Baumgartner Industrial Complex. Two air-sampling stations were located in Cambridge Pointe on its western edge between the asphalt plant and the subdivision. One air sampling station was set up to collect background comparison data and located near the First Tee Golf Range within the western edge of the Baumgartner Industrial Complex. See Figure 1. Two 24-hour sets of samples were collected each week during the 8-week sampling event from each of the three sampling stations. Each sample was analyzed for 24 different substances and particulates. (1)

DHSS has compared the results of these samples to comparison values (CVs) to determine whether or not the concentrations of substances and particulates found in the Baumgartner Industrial Complex pose a health threat. The CVs used in this health consultation include ATSDR's Environmental Media Evaluation Guide (EMEG), Minimal Risk Level (MRL), Cancer Risk Evaluation Guide (CREG), and the U.S. Environmental Protection Agency's (EPA's) Region 9 Preliminary Remediation Goal (PRG).

ATSDR has developed CVs such as EMEGs and MRLs that are media-specific concentrations used by health assessors to select environmental contaminants of concern. Contaminant concentrations that are less than EMEGs or MRLs are unlikely to pose a noncarcinogenic health threat. Contaminant concentrations above EMEGs or MRLs do not necessarily indicate that a health threat is present, but that further evaluation of the chemical and pathways is needed. EMEGs are based on the duration of exposure and are separated into three categories: acute (up to 14 days), intermediate (15 days to one year), and chronic (over 1 year).

ATSDR's CREG values and the EPA Region 9 PRGs used here estimate the concentration of a chemical a population must be exposed to daily for a lifetime (70 years) to add no more than one excess cancer case per one million individuals above what is normally expected. If these comparison values are exceeded, the situation does not necessarily pose a health risk, but it suggests that further evaluation may be appropriate. Both the CREG and PRG values are derived using theoretical and conservative calculations. The actual cancer risk is unknown and may be lower than calculated.

Site Investigation

Formaldehyde was the only chemical consistently detected during this sampling event that had concentrations known to be above CVs. The average concentrations of formaldehyde at the two monitoring stations near Cambridge Pointe were 2.56 parts per billion (ppb) and 1.63 ppb with the highest single day concentration of formaldehyde detected being 19.71 ppb. See Table 1. One sample did have a measured concentration of 65.3 ppb, but the laboratory performing the tests determined that this was not a reliable measurement. Therefore, it will not be taken into further consideration.

Table 1. Summary of Noncarcinogenic Health-based Comparison Values and Ambient Air Sample Results Collected in Baumgartner area from April 12, 2006 through June 2, 2006

Chemical Name	MDL in ppb	Concentration Detected in ppb	Acute EMEG/MRL ppb	Chronic EMEG/MRL ppb
Benzene	0.66 – 1.28	ND – 0.69	9	3
Formaldehyde	0.0138	0.08 – 19.71 *	40	8

* The concentration of formaldehyde found in the Baumgartner Industrial Complex typically ranged from 0.08 ppb to 3.66 ppb except for one sample which was 19.71 ppb.

ppb = parts per billion

ND = Non-detect: concentration of chemical was not detected by laboratory tests

Acute = exposure to chemicals for 14 days or less

Chronic = exposure to chemicals for more than 365 days

EMEG = Agency for Toxic Substances and Disease Registry's Environmental Media Evaluation Guide

MRL = Agency for Toxic Substances and Disease Registry's Minimal Risk Level

MDL = Method Detection Limit

Concentrations of formaldehyde detected by CEC in ambient air in the Baumgartner Industrial Complex were comparable to concentrations expected in a suburban area (3). The St. Louis Community Air Project (CAP) has collected ambient air samples for several years to monitor air quality in the St. Louis area (4). Formaldehyde concentrations measured by CEC in the

Baumgartner Industrial Complex were similar to concentrations found by CAP in other areas of St. Louis.

Benzene was detected one day at one air-sampling station, and benzo(a)pyrene, and dibenz(a,h)anthracene were not detected in air samples collected in the Baumgartner Industrial Complex. However, the laboratory methods used to measure these chemicals had Method Detection Limits (MDLs) above the CREG and/or PRG for these chemicals. It is not known at this time whether or not these chemicals are present in the Baumgartner Industrial Complex at concentrations that may increase cancer risk. See Table 2.

Table 2. Summary of Carcinogenic Health-based Comparison Values and Ambient Air Sample Results Collected in Baumgartner area from April 12, 2006 through June 2, 2006

Chemical Name	MDL in ppb	Concentration Detected in ppb	CREG in ppb	EPA Region 9 PRGs in ppb
Benzene	0.66 – 1.28	ND – 0.69	0.031	0.078
Benzo(a)pyrene	0.00011 - 0.00047	ND	NA	0.0000891
Dibenz(a,h)anthracene	0.000097 - 0.00042	ND	NA	0.0000808
Formaldehyde	0.0138	0.08 – 19.71 *	0.065	0.122

* The concentration of formaldehyde found in the Baumgartner Industrial Complex typically ranged from 0.08 ppb to 3.66 ppb except for one sample which was 19.71 ppb.

ppb = parts per billion

ND = concentration of chemical was not detected by laboratory tests

NA = concentrations not available

CREG = Cancer Risk Evaluation Guide for 1×10^{-6} excess cancer risk

MDL = Method Detection Limit

EPA Region 9 PRGs = Environmental Protection Agency Region IX Preliminary Remediation Goal

Some members of the community were concerned about the amount of dust, or particulate matter, created by the rock quarry and asphalt plant in the Baumgartner Industrial Complex. Crushing and grinding operations, and dust from paved or unpaved roads typically produce particulate matter in the air between 2.5 and 10 micrometers (PM₁₀) (5). CEC conducted testing for PM₁₀ in Cambridge Pointe, and the highest concentration of PM₁₀ found was 96.6 micrograms per cubic meter (µg/m³). This concentration is below EPA's National Ambient Air Quality Standard (NAAQS) of 150 µg/m³ for PM₁₀ over a 24-hour period. The EPA's NAAQS for PM₁₀ was developed to provide health and environmental protection (6). The EPA has also established a NAAQS for fine particulate matter less than 2.5 micrometers (PM_{2.5}), of 35 µg/m³ over a 24-hour period. However, PM_{2.5} samples were not collected or analyzed for in the Baumgartner Industrial Complex.

DISCUSSION

As stated above, formaldehyde was the only chemical consistently detected during this sampling event that had concentrations above CVs. The highest concentration of formaldehyde detected was 19.71 ppb. This concentration exceeded ATSDR's EMEG of 8 ppb for chronic exposure, but it did not exceed ATSDR's EMEG of 40 ppb for acute exposure. This 19.71 ppb

concentration of formaldehyde was well above the concentrations typically observed in the Baumgartner area sampling event. However, it was only observed at one monitoring station during one 24-hour sampling set. Due to the short duration of time that this concentration was observed, the concentration would have had to exceed the acute EMEG for formaldehyde in order for adverse health effects to be expected.

The average concentrations of formaldehyde at the two monitoring stations near Cambridge Pointe were 2.56 ppb and 1.63 ppb. The measured concentrations of formaldehyde exceeded the ATSDR's CREG for additive cancer risk of 0.065 ppb. However, typical concentrations of formaldehyde found in suburban areas range from about 2 to 6 ppb (3). Highly populated areas and industrial areas can range from 10 to 20 ppb (3). The St. Louis Community Air Project (CAP) reports annual average concentrations of 3.72 ppb of formaldehyde in the St. Louis area (4). Although the ambient air samples collected in the Baumgartner Industrial Complex were found to have concentrations that exceed the CREG for formaldehyde, the concentration of formaldehyde was well within the normal ranges for the St. Louis area. Thus, residents in the area are not at higher risk from formaldehyde exposure than are other St. Louis residents.

The laboratory analyzing the samples had Method Detection Limits (MDLs) for benzene, benzo(a)pyrene, and dibenz(a,h)anthracene that were above the health comparison values. This means that even though benzene was detected once, and benzo(a)pyrene and dibenz(a,h)anthracene were not detected at all during sampling, there is still a potential these chemicals were present at concentrations that could cause adverse health effects. Because the laboratory methods used were not sensitive enough to detect very low concentrations of these three chemicals, it is not known at this time whether or not these chemicals are present in the Baumgartner Industrial Complex at concentrations that may increase cancer risk.

Although benzene was only detected once during the Baumgartner investigation, CAP reported finding average annual ambient air concentrations of benzene at 0.448 ppb in the St. Louis area (4). Similar concentrations could be expected in the Baumgartner area.

TOXICOLOGICAL EVALUATION

This section will discuss the potential adverse health effects of exposure to formaldehyde, benzene, benzo(a)pyrene, and dibenz(a,h)anthracene. An outline of health effects and the likelihood of these contaminants causing cancer will be evaluated.

Formaldehyde

Formaldehyde is a colorless, flammable gas at room temperature. Formaldehyde gas is released into the air by fingernail polish, fingernail hardener, latex paint, grocery bags, paper towels, plywood, carpeting, particleboard, new clothes, car exhaust and many other items commonly found in homes. Cigarettes and other tobacco products, gas cookers, open fireplaces and our own bodies are known to produce formaldehyde. One of the major sources of formaldehyde is smog. (3)

Exposure to formaldehyde is often associated with symptoms of irritation of the eyes, nose and throat (3). Some individuals are more sensitive to formaldehyde than others, but symptoms often are not noticed until concentrations exceed 400 ppb to 3000 ppb (3). The concentrations of formaldehyde found in the Baumgartner Industrial Complex were well below concentrations where symptoms are typically noticed.

Formaldehyde may increase cancer risk to humans, based on sufficient evidence from animal studies and limited scientific evidence from human studies (3). Exposure to formaldehyde is often through inhalation, which makes cancer of the respiratory tract the most likely form of cancer associated with formaldehyde exposure (3). ATSDR has reported a CREG for formaldehyde of 0.065 ppb. CREG values estimate the concentration of a chemical a population must be exposed to daily for a lifetime (70 years) to add no more than one excess cancer case per one million individuals above what is normally expected. CREG values are derived using theoretical and conservative calculations. The actual cancer risk is unknown and may be lower than calculated.

Benzene

Everyone is exposed to some concentration of benzene in the air every day. Benzene is a major component of gasoline. Benzene is also found in tobacco, and the average smoker is exposed to 10 times more benzene than nonsmokers. Emissions from motor vehicle exhaust, evaporation from gas stations, and other industrial processes release benzene into the air. Individuals living in cities or industrial areas tend to be exposed to higher concentrations of benzene. Long-term exposure to benzene can cause cancer and has been associated with a specific leukemia called acute myeloid leukemia (AML). (7) ATSDR has reported a CREG for benzene of 0.031 ppb.

Benzo(a)pyrene and Dibenzo(a,h)anthracene

Benzo(a)pyrene and dibenz(a,h)anthracene are both polycyclic aromatic hydrocarbons (PAHs) and are found in smoke or soot when gasoline, garbage, or any animal or plant material burns. Heating a home with wood or coal, eating food that has been charcoal grilled or charred, and using tobacco products will increase an individual's exposure to benzo(a)pyrene and dibenz(a,h)anthracene. Asphalt-production plants, municipal trash incinerators, smoke houses, and facilities that burn wood, coal, or oil may release these compounds into the air. Benzo(a)pyrene and dibenz(a,h)anthracene have caused cancer in laboratory animals when applied to their skin, and benzo(a)pyrene has caused birth defects and lower-than-normal body weight when fed to laboratory animals. (8,9) The National Toxicity Program has determined that Benzo(a)pyrene and dibenz(a,h)anthracene are reasonably anticipated to be human carcinogens, and the EPA classifies them as probable human carcinogens.

Children's Health

ATSDR and DHSS recognize that infants and children have unique characteristics that may make them more susceptible to chemical exposures than adults. Children crawl on the ground, experiment by putting things in their mouth and sometimes eating them, and may not wash their hands as often as needed. In proportion to body weight, children ingest more food and water,

breath more air, and have different metabolisms than adults. Children's bodies are still developing and may be more sensitive to damage during various periods of development. The life expectancy of a child is longer than an adult, which allows more time for the damage done by a chemical to appear; this is especially important for carcinogens. Most importantly, children rely on adults to make decisions for them on risk identification, housing, and medical care. (3,7)

It is not known whether children are more or less likely to be affected by exposure to formaldehyde, benzene, benzo(a)pyrene, or dibenz(a,h)anthracene. Children and adults are likely to be exposed to these chemicals in the same way. Health effects of these chemicals on children are expected to be similar to the health effects on adults (3,7,8,9). Since the concentrations of chemicals in the Baumgartner Industrial Complex were similar to those found in other areas of St. Louis, no additional adverse health effects are expected for children.

CONCLUSIONS

This health consultation focuses on inhalation as the pathway of concern in the Baumgartner Industrial Complex. Because access to the quarry and asphalt plant is restricted by the sheer high wall, neither ingestion nor dermal contact pathways are likely to residents of Cambridge Pointe from site related chemicals. Based on data collected from air samples taken in the Baumgartner Industrial Complex from April 12, 2006 through June 2, 2006, the ambient air in the Baumgartner Industrial Complex is considered *No Apparent Public Health Hazard* for all chemicals tested for except benzene, benzo(a)pyrene, and dibenz(a,h)anthracene. This category is used for sites where exposure to site-related chemicals might have occurred in the past or is still occurring, but the exposures are not at concentrations likely to cause adverse health effects. This category is based on the following conclusions:

1. The concentrations of formaldehyde found in the Baumgartner Industrial Complex were similar to concentrations found in other areas of St. Louis County by other studies, and these concentrations are within a range of concentrations typically found in suburban settings in larger cities in the US.
2. Because comparable formaldehyde concentrations are found in other areas of St. Louis County, residents of Cambridge Pointe are not being exposed to higher concentrations of formaldehyde than other residents of St. Louis County.
3. Concentrations of all other chemicals tested for, except benzene, benzo(a)pyrene, and dibenz(a,h)anthracene, were below health-based comparison values.

The concentrations of benzene, benzo(a)pyrene, and dibenz(a,h)anthracene are not known in the Baumgartner Industrial Complex. Because of this, the Baumgartner Industrial Complex is considered an *Indeterminate Public Health Hazard* for these chemicals. This category is used when critical information is lacking to support a judgment regarding the level of public health hazard.

RECOMMENDATIONS

1. Even though concentrations of formaldehyde were not found to be higher in the Baumgartner Industrial Complex than in other areas of St. Louis County, individuals can still take precautions to reduce their exposure to formaldehyde. These precautions include not using tobacco products and ventilating the home when using products containing formaldehyde.
2. Further testing of benzene, benzo(a)pyrene, and dibenz(a,h)anthracene is needed to determine the health hazard of these chemicals in the Baumgartner Industrial Complex.
3. Some community members have expressed concerns about particles in the air smaller than were tested for during this sampling event. If further ambient air testing is done in the area, PM_{2.5} should be included.

PUBLIC HEALTH ACTION PLAN

This Public Health Action Plan (PHAP) for the Baumgartner Industrial Complex contains an explanation of the actions to be taken by the Missouri Department of Health and Senior Services (DHSS), the Agency for Toxic Substances and Disease Registry (ATSDR), and other stakeholders. The purpose of the PHAP is to ensure that this public health consultation not only identifies public health hazards, but provides an action plan to mitigate and prevent adverse human health effects resulting from past, present, and future exposures to hazardous substances at or near the site. Below is a list of commitments of public health actions to be implemented by DHSS, ATSDR, or other stakeholders at the site:

1. DHSS/ATSDR will address community health concerns and questions as they arise.

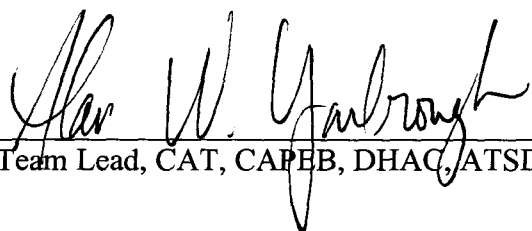
CERTIFICATION

The Missouri Department of Health and Senior Services (DHSS) prepared this Baumgartner Industrial Complex Health Consultation under a cooperative agreement with the federal Agency for Toxic Substances and Disease Registry (ATSDR). It was completed in accordance with approved methodologies and procedures existing at the time the health consultation were initiated. The Cooperative Agreement partner completed the editorial review.



Technical Project Officer, CAT, CAPEB, DHAC

The Division of Health Assessment and Consultation (DHAC), ATSDR, has reviewed this health consultation and concurs with its findings.



Team Lead, CAT, CAPEB, DHAC, ATSDR

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Attachments:

Figure 1: Baumgartner Industrial Complex, St. Louis County, Missouri

Figure 1

Baumgartner Industrial Complex, St. Louis County, Missouri



Missouri Department of Health and Senior Services, Division of Community and Public Health, Bureau of Environmental Epidemiology